

# Changes in States of Anxiety and Psychosomatic Reactions in Competition Periods during the Ramadan Fasting

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## Abstract

The objective of this study is the evaluation of changes in states of anxiety and psychosomatic reactions during the fasting month of Ramadan on 92 male athletes ( $23 \pm 3.35$  years) who responded during and outside Ramadan by means of three tests: State Trait Anxiety Inventory (STAI), Sport Competition Anxiety Test (SCAT) and Psychosomatics Battery (BPS). The results compared to normal periods, show a highly significant increase in state anxiety ( $p < 0.001$ ) and trait ( $p < 0.001$ ), competitive anxiety ( $p < 0.003$ ) during Ramadan. This increase is estimated respectively at 6.5%, 16.18% and 3.4%, as it is observed that a very significant rise ( $p < 0.001$ , +20.98%) of psychosomatic component scores physiological needs and somatic reaction, psychological states during this period. The stress of competition, changes in biorhythms and dehydration are factors leading to increased anxiety and psychosomatic reactions in trained athletes during the Ramadan fasting.

## Keywords

*Ramadan; Fasting; Anxiety; Psychosomatic Reactions; Competition; Sport.*

## Introduction

Fasting during the month of Ramadan represents one of the five pillars of the Islamic religion, in which one billion Muslims (after reaching the age of puberty) are required to comply with this religious obligation every year. During the month of Ramadan, practicing Muslims abstain from eating, drinking, and sexual intercourse from sunrise to sunset; the fast averages about 15 hours per day, for a period of 30 consecutive days, once per year.

Ramadan fasting is characterized with disturbances of

the sleep-wake, rest-activity cycle, and alters behavioral and diet patterns. Indeed, decreases in psychomotor performance (El-Mouddene, 1996), alertness, mood and memory (Lagarde et al., 1996; Lotfi et al., 2010) have been recorded at the beginning of the month of fasting, accompanied by increased irritability (Kadiri et al., 2000).

Several previous studies have reported a decrease in physical *performance* and on the level of fuel selection during Ramadan fasting, in professional soccer players (Zerguini et al., 2007 ; Donald et al., 2008), physically active subjects (Stephen et al., 2008 ; Stannard & Thompson, 2008), young athletes (Ben Salama et al., 1993), and untrained healthy subjects (Stannard, Buckley & Thompson, 2004).

However, few studies have explored the effect of Ramadan fasting on the psychological characteristics of athletes, such as vigilance (Aziz et al., 2010), memory (Lotfi et al., 2010), psychomotor reactions (Lotfi et al., 2010), perceived exertion of the training and sport performance (Zerguini et al., 2007 ; Leiper et al., 2008 ; Waterhouse, 2010 ; Ooi et al., 2010), vigor, depression, confusion, anger, fatigue, mood, and some psychophysiological needs (Leiper et al., 2008). From their responses, it can be concluded that the great majority of parameters were substantially impaired during and after physical exercise.

All official competitions are held during Ramadan and often scheduled in the afternoon from 15 hours to 17 hours just before breaking the fast at the end of the day. The training sessions are reduced and/or shifted compared to the usual period. The observation on

athletes in the field showed negative behavioral responses during Ramadan fasting including: nervousness, irritability, excessive violence, demotivation, weakness, which are expressed by athletes more frequently during official competitions than during training sessions.

Athletes who fast during Ramadan are called therefore to manage both physical and psychological stress. These athletes bear disturbances on the sleep-wake cycle, follow training programs, maintain performance during the competition, and manage stress weighed by the latter, while refraining from food and fluid intake. Moreover, technical directors, athletes, coaches, physical trainers, and sports physicians are devoid of theoretical and practical guidelines on the effects of fasting on physical performance, psychological and physiological disturbances. Consequently, athletes are exposed to different health risks. Therefore, there is a need to understand how Muslim athletes respond psychologically to the demands of participating in sports during Ramadan.

The aim of this study is to evaluate changes in states of anxiety and psychosomatic reactions of elite athletes during Ramadan fasting. This psychophysiological assessment could explain the origins of psychosomatic discomforts.

## Method and Subjects

### *Participants*

The study was performed on 92 healthy male Moroccan Muslim athletes (mean age  $23 \pm 3.35$  years) who are non-smokers from different sports (44 basketball players, 19 football players, 11 handball players and 9 endurance athletes, 10 combat sport athletes) and have participated in national-championship competitions. All subjects engaged in at least 2-4 training sessions five times each week for 3 years and continued their regular training program during Ramadan. Each subject was observed in fasting for an average 12 hours a day.

### *Research Design*

The study was conducted when Ramadan fasting occurred between October 15 through November 13. All questionnaires were administered to participants two weeks before Ramadan (Pre-R) and during the second and third week of Ramadan (During-R). All subjects responded to the questionnaires just prior to the warm-up phase, approximately 30-45 minutes

before the competition.

### *Measures*

*State Trait Anxiety Inventory (STAI, Spielberger, 1970).* The STAI form Y (STAI-Y) serving as an indicator of two types of anxiety: the state anxiety (S-Anxiety) and trait anxiety (T-Anxiety) as well as a measurement on the severity of the overall anxiety level, is an administered analysis of reported anxiety symptoms. The first subscale measures S-Anxiety, while the second measures T-Anxiety. The range of scores is 20-80; and higher scores indicate greater anxiety (Spielberger et al., 1970 ; Spielberger, 1983). The essential qualities evaluated by the STAI scale are feelings of apprehension, tension, nervousness, and worry. Scores on the STAI scale increase in response to physical danger and psychological stress, and then decrease as a result of relaxation training.

Dimensions of "state" anxiety (items 1-20) as well as "trait" anxiety (items 21-40) are rated on a 4-point intensity scale (almost Never [1 point], sometimes [2 points], often [3 points], almost always [4 points]). Some of the questions related to the absence of anxiety are reverse-scored. Both STAI-Y scales, for S-Anxiety and T-Anxiety, have been developed as one dimensional measure. The S-Anxiety scale consists of twenty statements that evaluate how respondents feel "right now, at this moment". The T-Anxiety scale consists of twenty statements that assess how respondents feel "generally." STAI has been shown to have acceptable validity and reliability coefficients for research purposes. The STAI-state and STAI-trait were found to be positively correlated with the Anxiety Sensitivity Index (Peterson & Reiss, 1987). According to the test-retest correlations provided by Spielberger et al. (1970, 1983) the STAI has a 0.54 (S-Anxiety scale) and the 0.86 (T-Anxiety) correlation. The reliability and validity evidences of this scale for an Arabic sample were obtained in the studies carried out by Allaoui & Radouan (1987).

*Sport Compétition Anxiété Test (SCAT, Martens, 1977).* The SCAT as a measurement on the tendency of an athlete to experience anxiety when competing in a sport, is used to measure competitive trait anxiety. Test scoring is based on 10 questions to assess individuals how they feel when competing in sports and games. Each item is answered on a three-point scale (often, sometimes, hardly ever) and a summary score ranging from 10 (low competitive trait anxiety) to 30 (high competitive trait anxiety) is computed for each

respondent. This test has been validated by Martens (Martens, 1977; Martens, et al., 1976) in all its psychometric components.

*Psychosomatic Battery (PSB, Allaoui & Radouan, 1987).* The PSB is a self-report questionnaire (Allaoui & Radouan 1987). This battery assesses psychosomatic reactions of athletes to the competitions and connecting psychological stress (anxiety, nervousness, irritability .. etc.) with physical malaise (the reactions of the stomach, heart, breathing, sleep disorders, abnormal weakness, headaches, breathlessness and other physical symptoms). This battery consisting of 40 items has two subscales: psychological states (20 items), physiological needs and somatic reactions 20 items (thirst, hunger, rest, physical malaise). Participants rated their feelings using a dichotomous items scored by 0 (do not feel) and 1 (feel very strongly). Higher scores mean higher level of discomfort. The PSB s first developed in healthy adults has been shown to have high internal consistency (0.788) and test-retest reliability over a 6-month period, good concurrent validity (Martens, 1977), high internal consistency ( $\alpha=0.788$ ).

### Data Analysis

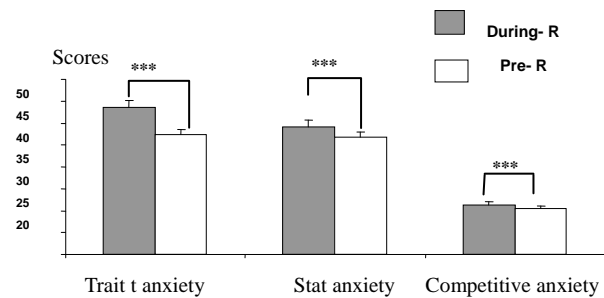
The data was analyzed using SPSS 16 (SPSS, Chicago, IL).The responses (Pre-R vs During-R) were examined using a two-tailed Student's t-test for dependent samples. The accepted level of significance was set at  $p < 0.05$ . Data are reported as mean  $\pm$  SD.

### Results

The means and standard deviations of the scores on trait and state anxiety, and competitive anxiety-trait, during and outside of Ramadan fasting are shown in Figure 1. The post hoc analysis (Table 1) shows that as compared to Pre-R, T-Anxiety and S-Anxiety scores increased significantly during Ramadan (16.18 %,  $p < 0.001$  , 6.5 %,  $p < 0.001$  respectively). In addition, results show a slightly significant (+3.4% ,  $p < 0.003$ ) increase in competitive anxiety scores during the Ramadan fasting.

Results regarding psychosomatic reaction scores during and outside of Ramadan fasting are presented in Table 1. The two-tailed Student's t-test showed a significant increase in the physiological needs and somatic reactions ( $p < 0.0001$ ), as well as negative psychosomatic state ( $p < 0.042$ ) levels at the end of Ramadan fasting compared to the control value (29.32 % , 11.95 % respectively). Indeed, the

psychosomatic overall score shows a significant increase ( $p < 0.0001$ ) of 20.98% during Ramadan compared to normal periods.



\*\*\*Significantly different from during R and Pre-R,  $P < 0.001$

FIG.1 COMPARISON OF TRAIT AND STATE ANXIETY AND COMPETITIVE ANXIETY-TRAIT SCORES DURING (DURING-R) AND AFTER (PRE-R) RAMADAN FASTING IN ATHLETES (N=92). VALUES ARE MEAN  $\pm$  SD.

TABLE 1. THE PSYCHOSOMATIC REACTION SCORES, SOMATIC REACTION AND PSYCHOLOGICAL STATES MEASUREMENTS DURING AND AFTER RAMADAN FASTING (N=92). MEAN  $\pm$  SD)

Subscales	n	During Ramadan fasting	After Ramadan fasting	P
Physiological needs and somatic reactions	92	6.89 $\pm$ 3.17	4.87 $\pm$ 2.58	0.0001
Psychological states	92	6.61 $\pm$ 5.02	5.82 $\pm$ 4.76	0.042
Total score	92	13.50 $\pm$ 7.35	10.68 $\pm$ 6.72	0.0001

P : probability of significance ( $p < 0.05$ ) increased by the paired student t-test, n : number of athletes.

### Discussion

In this study, we evaluated the psychosomatic reactions and the anxiety states in athletes, Morocco, who engaged in championship competition during the Ramadan fasting compared to normal conditions.

Anxiety is a physiological state characterized with cognitive, somatic, emotional, and behavioral components (Seligman, Walker & Rosenhan, 2001). The literature confirms a multidimensional relationship among cognitive anxiety, somatic anxiety, self-confidence and physical performance. According to Martens et al. (1977) anxiety has both cognitive and somatic components. Cognitive anxiety has been described as "...the mental component of anxiety and is caused by negative expectations on success or by negative self-evaluation" (p. 6), while somatic anxiety refers to "...the physiological and affective elements of the anxiety experience that is developed directly from

autonomic arousal" (p. 6). Our results show a highly significant increase in S-Anxiety (6.5%) and T-Anxiety (16.18%) as well as competitive anxiety (3.4%) during the fast of Ramadan. These results are due to the change of nycthemeral rhythm induced by the activities of the Ramadan fasting, including evening prayers, familial obligations. Ramadan fasting also requires feeding at night during a shortened time interval ranging from 10 hours in winter to 6 hours in summer; affecting the quality and quantity of sleep, which is interrupted and shortened to take the last meal (Shour). In addition to the imperatives of training, competition, academic and professional pursuits continue from 9:00am to 4:30pm), preventing athletes from additional periods of sleep during daytime naps. This disruption of sleep-wake rhythm has therefore a negative impact on physical performance and mood states of athletes.

As a result, previous studies on sleep and vigilance during Ramadan have shown that the decrease in sleep time and its fragmentation by waking one or more times has a negative influence on cognitive function, hormonal rhythm disorder (corticostérone, cortisol, mélatonine), and anxious reaction during the first week of fasting. Indeed, some works have shown that a reduction to 5.5 hours of sleep causes a significant decrease in psychomotor performance (Roky et al., 2000), daytime vigilance, poor mood (Horne & Wilkinson, 2007 ; Dinges, 1995) and cognitive disturbances early (Picher & Huffcutt, 1996). Our findings are in concordance with the result of most descriptive and experimental studies which show deterioration of mood states and an increase in discomfort in athletes and sedentary subjects during Ramadan fasting, manifested as sleepiness, fatigue, nervousness, hunger, thirst, headache, dizziness and gastrointestinal disturbances (Karli et al., 2007 ; Leiper et al., 2008 ; Chennaoui et al., 2009 ; Chaouachi et al., 2009 ; Aziz et al., 2010). Previous studies also have shown that, during Ramadan, fatigue is high after different exercises at any level of physical fitness (Karli et al., 2007 ; Leiper et al., 2008 ; Chennaoui et al., 2009 ; Aziz et al.,

2010). Usually these feelings of fatigue increased during the first two weeks and disappeared after breaking the fast (Chaouachi et al., 2009).

Similarly, our results are also confirmed by the study conducted by Kadiri et al. (2000) which showed that during Ramadan fasting, as compared to normal conditions, there is a significant increase in the degree

of irritability related to consumption of stimulants (coffee and tea) in sedentary subjects (smokers and non-smokers). Indeed, some literature data on the fasting headache, has concluded that hypoglycaemia and caffeine withdrawal have been especially implicated as causative factors (Torelli et al., 2009)

The second result of this study showed a significant increase in the negative of psychological states (20.98%) of athletes during the fasting month of Ramadan compared to normal periods. These statements have often led to a tendency of nervousness, turbulence, disobedience, lack of demotivation, distraction, strife and a low tolerance level; which emerged during the competitions of collective sports.

It was also found through this study that a significant increase in physiological needs and somatic reactions (29.32%) among all the athletes. These needs are related to thirst, hunger, and the need for recuperation and result in difficulties expressed as discomfort including physical tiring, headache, visual disturbances, muscle spasm, and tendonitis, etc. This discomfort particularly increases at competitions in warm climates where intense and continuous efforts are accompanied by periods of incomplete recuperation. The comparison between fasters and non-fasters in some studies shows that athletes suffer from an empty stomach discomfort expressed by psychophysiological symptoms such as: a decrease in physical strength (Kinugasa, Nair & Aziz, 2010) increased feelings of hunger and thirst (Leiper et al., 2008), an increase in headaches and dizziness (Zerguini et al., 2007), drowsiness and digestive problems during high physical load (Khalfallah, et al., 2003.), which is probably a physiological reaction against the change in lifestyle during the month of fasting.

Our result is consistent with the results of Schmahl and Mezter (1991), who quantified the symptoms observed during the Ramadan fasting, found an increase in tiring, anxiety, headache, nausea, hemoconcentration and tachycardia especially in the afternoon and evening. Our results are also confirmed by an investigation conducted with high-level Moroccan athletes, showing the belief held by athletes that training (58%) and competition (82.5%) are very tiring and exhausting during Ramadan (Lotfi et al., 2004). This result could be explained by four factors: hypoglycemia, dehydration, schedule sleep-wake disorder, and stress induced by the competitive sports. The combination of these factors has an automatic negative effect on physical performance and

mood state. However, further studies are needed in order to estimate the degree of contribution of each factor. It is suggested as well that a correlation analysis between psychosomatic and physiological components may reach this result.

In conclusion, the level of trait and state anxiety increased significantly. The results also showed a slightly significant increase in competitive anxiety scores, and in the negative psychosomatic state levels during the Ramadan fasting, mainly resulting from hypoglycemia, dehydration, altered sleep-wake cycles, and competitive stress. Psychological support during this period may optimize the performance of Muslim athletes. We suggest restructuring competitions and training programs with these results in mind. Further experiments are required to determine whether training and competition during fasting have an impairing effect on psychosomatic components in different level of fitness.

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